# CLUSTERING OF FREQUENCY-BASED VIBRATION SIGNAL FOR BEARING FAULT DETECTION

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# CLUSTERING OF FREQUENCY-BASED VIBRATION SIGNAL FOR BEARING FAULT DETECTION

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Report submitted in partial fulfillment of the requirements
for the award of Bachelor of Mechanical Engineering

Faculty of Mechanical Engineering
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## EXAMINER'S DECLARATION

I certify that the project entitled "Clustering of Frequency-Based Vibration Signal for Bearing Fault Detection" is written by Chia Ming Xuan. I have examined the final copy of this report and in my opinion, it is fully adequate in terms of language standard, and report formatting requirement for the award of the degree of Bachelor of Engineering. I herewith recommend that it be accepted in partial fulfillment of the requirements for the degree of Bachelor of Mechanical Engineering.

MR. MUHAMMAD HATIFI BIN MANSOR

Examiner Signature

## SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project and in my opinion, it is fully adequate in terms of language standard, and report formatting requirement for the award of the degree of Bachelor of Mechanical Engineering.

Signature :
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Date : 18 JUNE 2013

## STUDENT'S DECLARATION

I hereby declare that the work in this report is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of the other degree.

Signature :
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| | |
|---|---|
| $Hz$ | hertz |
| $kHz$ | kilo hertz |
| $F$ | force |
| $k$ | stiffness |
| $c$ | damping coefficient |
| $x$ | displacement |
| $\dot{x}$ | velocity |
| $\ddot{x}$ | acceleration |
| $k$ | spring constant |
| $m$ | mass |
| $\Delta$ | distance travel |
| $w$ | weight |
| $\bar{x}$ | mean of $x$ |
| $C^{n^2}$ | matrix with $n$ rows and $n$ columns |
| $c, cov$ | covariance |
| $Dim$ | dimension |
| $eig$ | eigenvector |
| $mV/g$ | mili volts per gravity |

# LIST OF ABBREVIATIONS

| | |
|---|---|
| ASiVR | Advance Structural Integrity and Research |
| NI-DAQ | National Instrument Data Acquisition System |
| PCA | Principal Component Analysis |
| RPM | Revolution per minute |
| rev | revolution |
| min | minute |
| SOM | Strength of material |
| D. C. | Direct current |
| FFT | Fast Fourier Transform |
| FDI | Fault Detection and Isolation |
| PC | Principle component |